Clean School Bus USA Assistance Agreement

Submitted to: Environmental Protection Agency (EPA)
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Table A
Fleet Information Table

No.	Bus Number	Bus Chassis Mfg	Bus Type A,B,C,D	Chassis Model Year	Engine Mfg	Engine Model No. & Year	Annual Vehicle Miles Traveled	Fuel Usage Gals/ Year	Retrofit (See Project Description)
1	138	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	12,279	1,535	D PM Filter
2	139	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	12,065	1,508	D PM Filter
3	140	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	19,816	2,477	D PM Filter
4	141	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	15,156	1,895	D PM Filter
5	142	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	12,932	1,617	D PM Filter
6	143	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	20,367	2,546	D PM Filter
7	144	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	20,900	2,613	D PM Filter
8	145	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	18,965	2,371	D PM Filter
9	146	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	14,844	1,856	D PM Filter
10	147	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	20,862	2,608	D PM Filter
11	148	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	21,374	2,672	D PM Filter
12	149	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	16,934	2,117	D PM Filter
13	150	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	13,150	1,644	D PM Filter
14	151	BlueBird	D	2001	Cummins	5.9 L TurboDiesel 2001	11,581	1,448	D PM Filter
15	48	BlueBird	D	1997	International	T444E	14,759	1,845	D PM Filter
16	31	GMC	A	2001	GMC	6.5 L	15,068	1,884	D PM Filter
17	32	GMC	A	2001	GMC	6.5 L	13,062	1,633	D PM Filter
18	33	GMC	A	2001	GMC	6.5 L	13,802	1,725	D PM Filter
19	155	BlueBird	B	2001	International	T444E	19,337	2,417	DOC + Spiracle
20	243	International	D	2002	International	T444E	9,323	1,165	D PM Filter
						Totals	316,576	39,572	

Narrative Work Plan

1. Describe the school bus fleet in general and its history:

This grant application is being submitted by Regional School District 18 on behalf of the communities of Lyme and Old Lyme, Connecticut. The Regional School District is comprised of the aforementioned suburban / rural communities and each community has a long history of sensitivity and commitment to open space, wetland and estuary preservation and a healthy and wholesome quality of life. The district enrollment has remained consistent over the past 5-7 years at approximately 1,600 students (Grades PreK-12). While the school district is rather small by student enrollment data, it is quite large in its geographic composition as it covers 58.85 square miles. The population density is 296 and 63 people per square mile in Old Lyme and Lyme respectively.

As a result of the expansive geography of the district and low population density, lengthy bus rides are endured each day by elementary and secondary students (many daily bus routes represent approximately 45-60 travel time minutes each way). This presents a growing health and safety concern for both school and community decision makers. As is well verified[1], diesel emissions research has proven a cumulative impact relative to the exposure to diesel emissions over time for the young student passengers of diesel fueled vehicles.

Old Lyme is bisected by the busy I-95 corridor. Vehicle emissions from the highway impact our community. I-95 has been the subject of EPA funded studies to establish an anti-idling corridor in the U.S. For example, the NESCAUM Truck Stop Electrification (TSE) Workgroup is exploring ways to expedite TSE implementation along the I-95 corridor. Our efforts to reduce emissions in our community will support this EPA effort.

In addition, the district's current bus depot is located in a residential area and some of the adjacent property owners have expressed health and safety concerns related to emissions. Therefore, this funding application is designed to enhance school district and community safety for students and local residents. In fact, we believe it is the next logical step for the communities of Lyme and Old Lyme toward reducing harmful diesel pollution by implementing the proven technologies of ultra low sulfur diesel fuel and diesel particulate filters. The grant has been prepared to insure that our school buses comply, as close as the available and proven technology will allow, with 2007 EPA standards in order to enhance the sustained effectiveness and longevity of the proposed initiatives. Of course, First Student will continue to enforce its procedures and the Connecticut regulations on anti-idling. (See attachments 1 and 2.)

[1] Reference: "Children's Exposure to Diesel Exhaust on School Buses," EHII, Dr. Wargo, et al., 2002.

The community commitment to this important health and safety initiative and the future sustainability of the proposed pollution reduction is best evidenced by the community representation on our grant writing team.

It must be noted that the 2005-2006 school budget and the current transportation contract does not include funding for the fuel and filter technologies that would be covered by this grant. Without the grant funding, it is likely that the school district's pollution / emissions reduction plans will be deferred until the required funding can be secured from other external sources. Public education in this community is funded primarily through real estate taxes thereby making public dollars and annual increases to the education budget difficult to justify and secure through referendum.

The number of buses in the fleet to be utilized in 2005-2006 is 20 diesel route vehicles and the number of students to be transported daily is estimated at 1,150. The district is comprised of 1,600 students (Grades PreK-12) with grade level enrollment distributed as follows:

2005-2006 Enrollment Data

	Old Lyme	Lyme	Total
PreK =	28	7	35
Kindergarten =	83	26	109
Grade 1 =	100	28	128
Grade 2 =	77	20	97
Grade 3 =	77	21	98
Grade 4 =	96	25	121
Grade 5 =	87	25	112
Grade 6 =	106	24	130
Grade 7 =	115	19	134
Grade 8 =	71	23	94
Grade 9 =	113	23	136
Grade 10 =	101	31	132
Grade 11 =	100	20	120
Grade 12 =	92	22	114
	1,246	314	1,560

The fleet replacement rate for the existing fleet of buses is as follows: Current 2001 vehicles will run through 2010, at which point a new contract will be drawn up to replace the fleet based on age. Vehicles will be replaced on an as-needed basis, notwithstanding the aforementioned age requirements.

The contract requirement delineating the fleet replacement specifications for the next five years (2005-2010) are that no vehicle that is more than seven years of age may be entered into service through the life of the contract.

2. Project Description and Implementation Plan:

A. Describe the project in detail The retrofit technology proposed in this grant application consists of diesel particulate matter filters to be installed on each bus in the fleet[2] as well as the conversion to ultra low sulfur diesel fuel. The school district grant proposal includes retrofitting each bus listed on the Fleet Information Table A on page 2. The buses in the fleet are owned, operated and maintained by First Student Transportation, Inc. The company is very supportive of this grant application and the use of current proven technologies designed to reduce diesel emissions and improve public safety. In fact, First Student Transportation, Inc., has successfully completed a similar full fleet retrofit project with the Norwich Public Schools in Norwich, CT and has currently started the same process with the New Haven Public Schools in New Haven, CT. So, the school district's transportation provider is quite familiar with the current pollution reduction technologies as well as the processes and procedures involved in retrofitting and subsequently maintaining a retrofitted bus fleet.

Lyme/Old Lyme Public Schools will convene a technology selection team to evaluate proposals received in response to the RFP. As part of a Cooperative Agreement, EPA Region 1 will be included. Other members of the technology selection team would likely include: The Procurement Offices and Project Manager from the towns of Old Lyme and Lyme, Representatives from the First Selectman's Office and the Town Planning Department from each town, First Student, CTDEP and outside experts in the area of diesel emissions. We will also attempt to include experts in environmental public policy, such as Environment Northeast and the Northeast States for Coordinated Air Use Management (NESCAUM) as project partners. A communications strategy will be developed to ensure that the community is informed of decisions made by the technology selection team. We expect the Cooperative Agreement to involve the EPA Project Officer and the above selected applicants. Further, we expect EPA will negotiate precise terms and conditions relating to substantial involvement as part of the award process, the anticipated substantial Federal involvement for this project will be to:

1. monitor closely the successful applicant(s) performance,
2. collaborate during the performance of the scope of work,
3. review proposed procurements in accordance with 40 C.F.R. 31.36(g),
4. approve proposed changes to work plan and/or budget,
5. approve qualifications of key personnel, and
6. review and comment on reports prepared under the assistance agreement.

Our ultimate goal is to enhance safety by reducing diesel emissions to meet the EPA Heavy Duty Diesel Engine Standards of 2007. We have provided the strategy to attempt to reach this goal in section 2B.

The retrofit work will be subcontracted to an EPA verified manufacturer's representative of diesel particulate matter filters in accordance with the Cooperative Agreement cited

[2] Our Type B bus will use a DOC and Crankcase ventilator as potential vendors have said a Diesel PM filter may not fit.

above. A filter cleaning schedule will be adopted to meet the time or mileage specified by the manufacturer's recommendations. Exhaust temperatures will be measured to insure the Diesel PM Filter technology is appropriate. If for some reason, exhaust temperatures are not sufficient enough to allow the Diesel PM Filter technology to work properly, DOC and Crankcase ventilation filters will be the fall-back technology. Discussions will be conducted with members of the technical team to verify these conclusions. In addition to the data log temperature measurement, a moderate emission measurement program will be initiated to validate the installation.

Public awareness and education is also an integral part of the project. The various methods used to meet this goal will include public forums, informational mailings to taxpayers and residents, a media-represented open house to initiate the program, celebration of the first retrofit, a local proclamation by both first selectmen and special Earth Day lessons regarding diesel emissions.

The following "good faith" project timeline has been developed for your review. The dates are based on the assumption of a contract award date of September 30, 2005 and a release of funds date of January 1, 2006.

October 5, 2005 - December 5, 2005
- Develop membership of Cooperative Team
- Release of information to community

January 2, 2006 – January 13, 2006
- Measure the exhaust pipe temperatures in the vicinity of the proposed installation
- Finalize the appropriate technology

January 16, 2006 – February 28, 2006
- Bidding and Review of Project / RFP

March 2, 2006 – August 31, 2006
- Ordering of Retrofit Materials/Supplies/Equipment
- Installation of Filters
- Initial Testing of Installation Process, temperature and emissions

June 26, 2006 – June 28, 2006
- Initial grade 6-8 teacher orientation on EPA curriculum

July 1, 2006 – September 15, 2006
- Communication with Parents & Community

September 1, 2006 – January 26, 2007
- Monitoring of Project Effectiveness

B. Pollution Reduction Strategy Meeting EPA Goals The Lyme-Old Lyme Public School's strategy to obtain the most beneficial and effective diesel emissions cleanup is to create an emissions policy that follows the Connecticut and First Student Anti Idling regulations and the 2007 EPA Heavy Duty Diesel emissions standards within the limits of current proven and available products. Ultra Low Sulfur Diesel fuel will be used. The successful implementation of this strategy will:

a. Insure that the anti-idling provisions of attachments 1 and 2 are adhered to

b. Provide students and bus drivers with cleaner air and a substantially healthier environment by retrofitting the existing buses with emission control devices
c. Contribute to the Clean Air initiatives of EPA
d. Educate our students, future consumers, on the importance of air quality
e. Illustrate to our citizens the type of commitment that must be made to adequately address mobile emissions.

For the most part, the diesel engines for the Lyme-Old Lyme Public School Bus Fleet were manufactured in accordance with 1998 EPA emission standards. These standards and the 2007 standards set the limits in grams/brake horsepower - hour:

Emission	1998 Emission Standard [3]	2007 Emission Standard [4]
NOx	4.0	3.5
PM	0.10	0.01
CO	15.55	-
NMHC	1.3	0.14

Table B is a cost benefit analysis of the various verified technologies that are available.

Cost Benefit Analysis
Comparison

Table B

Technology	Unit Cost	Annual Maintenance Cost per Bus	On Site Maintenance Cost per Bus	Annual Cost per Bus	Annual Cost 20 Buses	Tailpipe Efficiency PM	Overall System Efficiency PM
DOC	$900	$0	$0	$0	$0	20%	15%
DOC + Spiracle	$1,900	$40	$50	$90	$1,800	20%	30%
D PM F	$8,000	$450	$100	$550	$11,000	85%	65%
D PM F maint - own 2 ovens, depreciate in 3 yrs[5]	$16,000	$267	$150	$417	$8,333		
Data Logger	$300		$1,000		$1,000		

Notes:

DOC – Diesel Oxidation Catalyst
Spiracle – Filter device that operates on diesel crankcase vented gases (a Donaldson proprietary device)
D PM F – Diesel Particulate Matter Filter
Oven is required to bake DPFs – units must be removed and put in the oven
Overall system efficiency includes crankcase emissions
D PM F will more than likely not be able to be used on the small van bus

[3] EPA "Emissions Standards Reference Guide for Heavy Duty and Non-Road Engines" 1997
[4] EPA: "Voluntary Diesel Retrofit Program – Diesel Emissions Timeline" October 17, 2002
[5] This is currently not an option as First Student currently does not have the space nor personnel required.

Basing calculations on tailpipe PM to obtain a reduction from 0.10 to 0.01 g/bhp-hr requires a 99% reduction. This is not possible within today's after treatment technology. The best reduction can only be partially satisfied using ULSD and Diesel PM Filter equipment, as can be seen from Table B. This will provide a PM tailpipe efficiency of approximately 85% and an overall system reduction of 65%. This represents a major accomplishment in meeting the goals of the project.

Note that the budget includes a data logging function to accomplish two tasks:

a. Prior to installation in each of the buses, determine if the Diesel PM Filter can function given the temperature of the input exhaust gases –
   If this condition is negative, then insulation will be installed on the exhaust pipe and the test repeated. If low temperature is still a problem, the fall back position will be to use the DOC and Spiracle products.

b. If after initial conditions are determined to be Diesel PM Filter friendly,
   determine, on a periodic basis, if the Diesel PM Filter input temperature has been seriously effected by changing engine operating or external temperature conditions in which case insulation will have to be installed around the exhaust pipe.

For **Outcomes**, the Lyme-Old Lyme School System anticipates reducing the overall tailpipe particulate matter pollution by approximately 85% per vehicle through the use of Diesel PM Filter technology. A successful program in Old Lyme can lead to a partnership with our neighboring school districts of Westbrook and Regional School District 4 (Essex, Chester, Deep River and Ivoryton) that also contract their transportation with First Student Transportation, Inc. The accomplishment of this program will be a model for suburban/rural school districts in areas of serious air quality problems where students spend long times on school buses. The EPA Connecticut Schools Air Quality Curriculum will be introduced to our grades 6 to 8 teaching staff this year and implemented in the following year. Finally, there will be public education about the Clean School Bus retrofit program and its implications for the local communities.

The anticipated **Outputs** for this project are that approximately 20 buses will be retrofitted using Diesel PM Filters and cleaner ULSD fuel, an estimated 1,150 children will be riding cleaner buses each day, and the program will raise the consciousness level of air quality in this region of Connecticut.

C. Sustainability, Likelihood for Success and Partner Support The school district is planning to initiate the transition to ultra low sulfur diesel fuel and diesel particulate filters on all buses in the fleet by utilizing 95% grant funding and 5% district/town funding. In future years, we hope to initiate a partnership with our neighboring school districts of Westbrook and Regional School District 4 (Essex/Chester/Deep River/Ivoryton) that also contract their transportation with First Student Transportation, Inc. Further, in our next transportation contract (2010), we intend to specify and require

all bidders to include in their fleet retrofitted buses that utilize ultra low sulfur diesel fuel and diesel particulate matter filters or the most modern and effective technologies of the day. This grant has been collaboratively prepared by the following institutions / individuals: David J. Klein, Superintendent of Schools; Marilyn Warren, School Business Manager; Michael Dussere, First Student Transportation Manager; Bonnie Reemsnyder, Old Lyme Selectwoman; Timothy Griswold, Old Lyme First Selectman; and Michael A. Tucchio, PhD, President of Creative Technologies, Inc. As a result of this collaboration of community members, who are also affiliated with the school district and local government, we are confident that this commitment to the reduction of pollution and harmful emissions will continue and expand throughout the community. In fact, if the grant application is approved, the school district will be serving as a recognized air quality improvement leader within the community and the region.

The towns of Lyme and Old Lyme are pursuing reduced emissions with their municipal vehicle fleets through the bulk purchase of ultra low sulphur diesel fuel. This municipal initiative seeks to involve the participation of a larger number of towns in the lower Connecticut River Valley who are also interested in the bulk purchase of ultra low sulphur diesel fuel.

Letters of support for this proposed project are included in attachment 3. The supporters of this program and the contributions they have made and will be offering include:

1. Connecticut Department of Environmental Protection - have reviewed rough drafts of this proposal and will be included in our project management team.
2. Environment Northeast - will be included in reviews of our progress and consulted with for their opinions.
3. Connecticut Clean Energy Fund - will be included in reviews of our progress.
4. Marilyn Giuliano, State Representative; William Koch, First Selectman - Lyme; Andrea Stillman, State Senator; Rob Simmons, Member of Congress; Eileen Daily, State Senator; and Timothy Griswold, First Selectman - Old Lyme - will be included in reviews of our progress and be advocates for Air Quality projects.
5. First Student, Inc., - will be an active participant in our project and included in the management team.
6. Mystic Air Quality Consultants - will be an active participant in our project and included in reviews of our progress.
7. Dr. Vijay Sikand, Old Lyme Director of Health - will be included on the Cooperative Agreement team as an expert consultant.

D. Other Policies Indicating Commitment to Pollution Reduction The work to be accomplished under this proposal is in compliance with the Connecticut DEP Diesel Risk Reduction Strategies[6] and the 2005 Connecticut Clean Diesel legislation[7] goals.

First Student, Inc. implemented an anti-idling policy in 2001, prior to any CT state laws on the subject, in order to minimize diesel emissions in public areas. The policy follows

[6] CTDEP Diesel Risk Reduction Strategies see: http://www.dep.state.ct.us/air2/diesel/diefac.pdf
[7] Connecticut Legislature 2005 session: Special Act No. 05-7

the same guidelines as the current Connecticut statute, Public Act No. 02-56, approved on May 9, 2002 (See attachment 1). A brief thumbnail sketch of these procedures are basically that no buses shall idle for more than three (3) minutes at any time unless the engine needs to be on to run safety equipment, the temperature outside is below 20 degrees Fahrenheit, or the buses need to be warmed up to proper operating temperature. Although First Student currently trains all drivers on this anti-idling policy, as part of this grant First Student will also install signs as a reminder to drivers on this policy.

Regional School District 18 has also implemented other programs to provide for a healthy and safe learning environment. These include a district-wide air quality program using the EPA based 'Tools for School' program. Each of our five schools has a Tools for Schools team that annually evaluates building environmental health and works closely with the Facilities group to provide the best possible environmental conditions. Additionally, the school district's Facilities group utilizes an automated preventative maintenance program to keep the heating and ventilation systems in good working order. We utilize high efficiency ventilation filtration to minimize particulate inside the buildings. Chemical usage is strictly controlled in the district. We have taken the initiative to convert our cleaning product to 'green products'. Pesticide usage is limited and applied by licensed applicators. When needed on the athletic fields, pesticides are applied only on an 'as required basis' with the approval of the school district's Director of Facilities. Energy usage is managed by the use of a centralized energy management system. This allows for strict controls of temperatures and unoccupied temperature setbacks during the school year. Additionally, light fixtures have been upgraded to energy efficient designs with the exception of a limited number in the high school. This year we will be introducing a new to the market replacement fluorescent bulb. This bulb is not only more energy efficient than previous models, but it also simulates natural light, which has been shown in studies to enhance the learning environment.

EPA has a curriculum that was developed specifically for the Clean School Bus program. See http://www.k12science.org/curriculum/norwich/trainingpage.html. As noted previously, this curriculum will be implemented within the district.